Monitoring of Transport Infrastructures by using Synthetic Aperture Radar Satellites

Davide Oscar Nitti

Geophysical Applications Processing - G.A.P. SrL

POLIBA Spin-off company

SPACE 4YOU

SPACE, A DRIVER FOR COMPETITIVENESS AND GROWTH

Regione Puglia

distretto aerospaziale pugliese

nereus network of european regions using space technologies

GAP SrL - Company Profile

Geophysical Applications Processing s.r.l. is a spin-off company of Politecnico di Bari, established on **February 2006**, whose **mission** is to develop products, processes and services with technological and scientific value in the field of satellite remote sensing and related HW/SW technologies, with a focus on Geomatic solutions and applications.

All the ***activity*** is performed on the basis of competencies and pay-offs of research projects, particularly in the Remote Sensing Group of the Department of Physics of Bari, in collaboration with the Institute for high studies on Intelligent Automation Systems (ISSIA) of the National Council of Research (CNR), based in Bari, Italy.

GAP is member of:

AIPAS
ASSOCIAZIONE DELLE IMPRESE PER LE ATTIVITÀ SPAZIALI

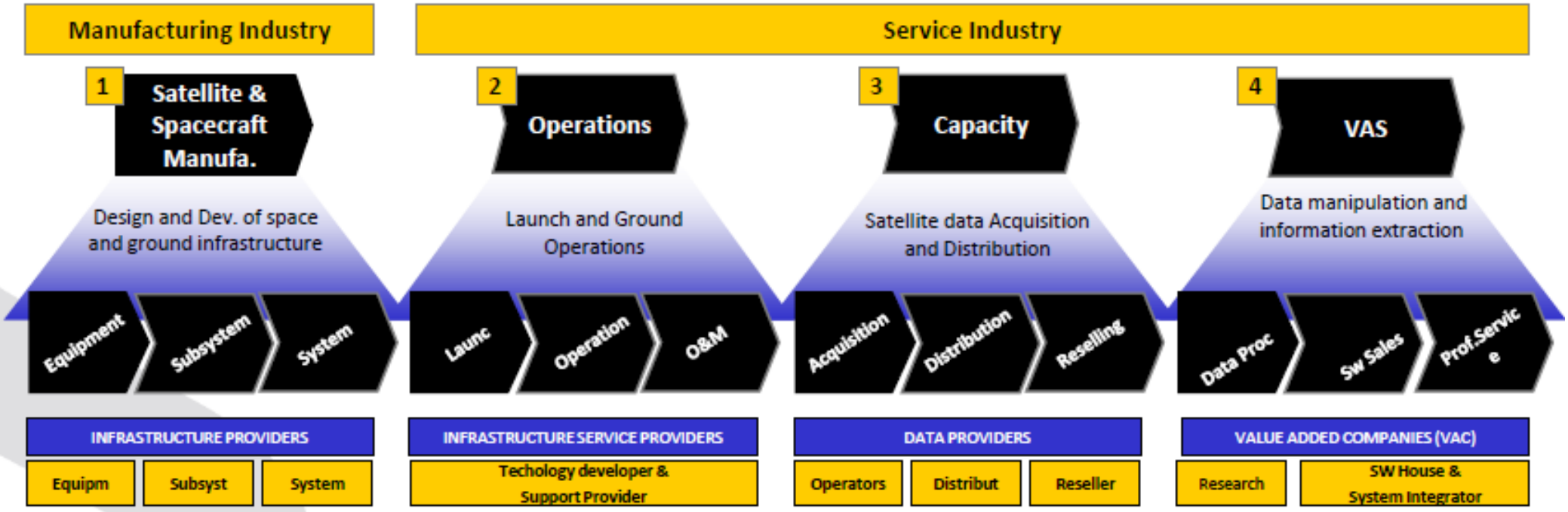
distretto aerospaziale pugliese

Shareholders of GAP are Politecnico di Bari, Planetek Italia srl and seven professionals among Polythecnic professors, CNR researchers and young Physics and Engineering graduates.

distretto aerospaziale pugliese

Apulian Space Industry

Know how



SITAEL: Electronics & microelectronics Systems

ENGINSOFT: Virtual prototyping

SSI: Large software design & development

SITAEL: Ground Equipment EGSE

SSI: Operations preparation planning

Planetek: System development & Data Distribution

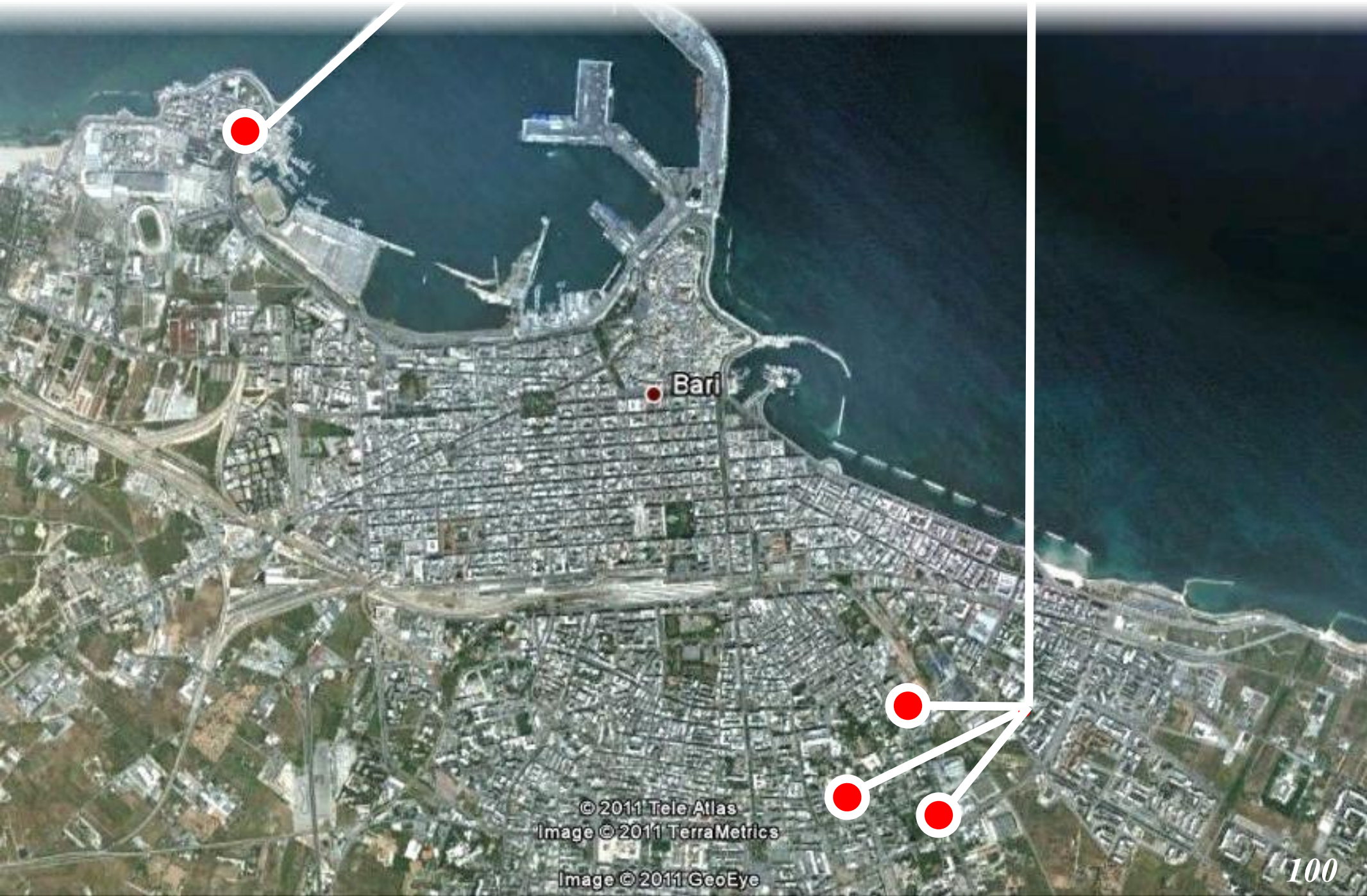
GAP: Remote sensing processing & applications

Planetek: GIS applications

SIT: Coastal & topography applications

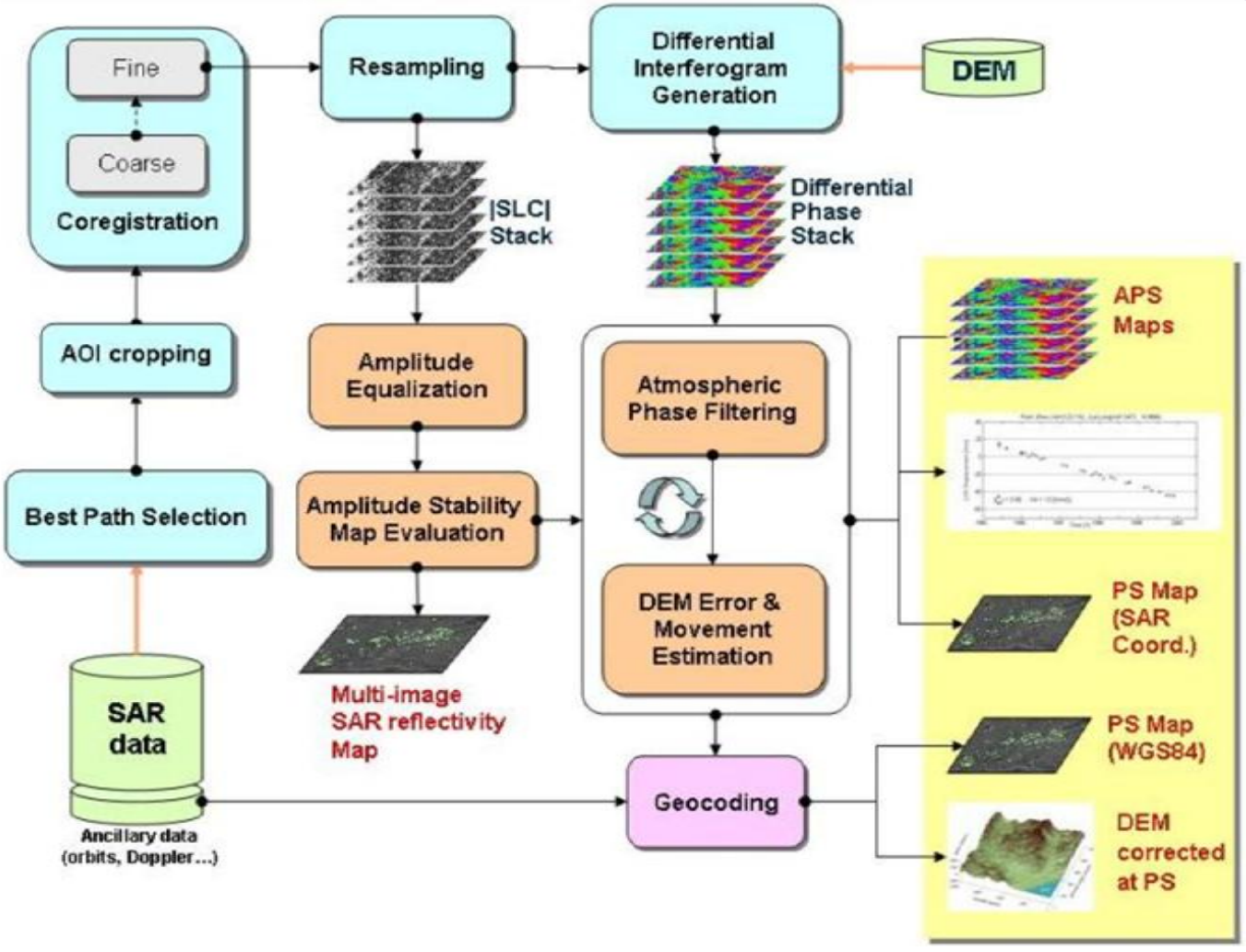
SSI: Swarm Intelligence applications

Bari


Bari
© 2011 Tele Atlas
Image © 2011 TerraMetrics
Image © 2011 GeoEye

SPINUA PSI-like processing chain

Stable Point Interferometry even in Un-urbanized Areas



LEWIS project – Landslide Early Warning Integrated System

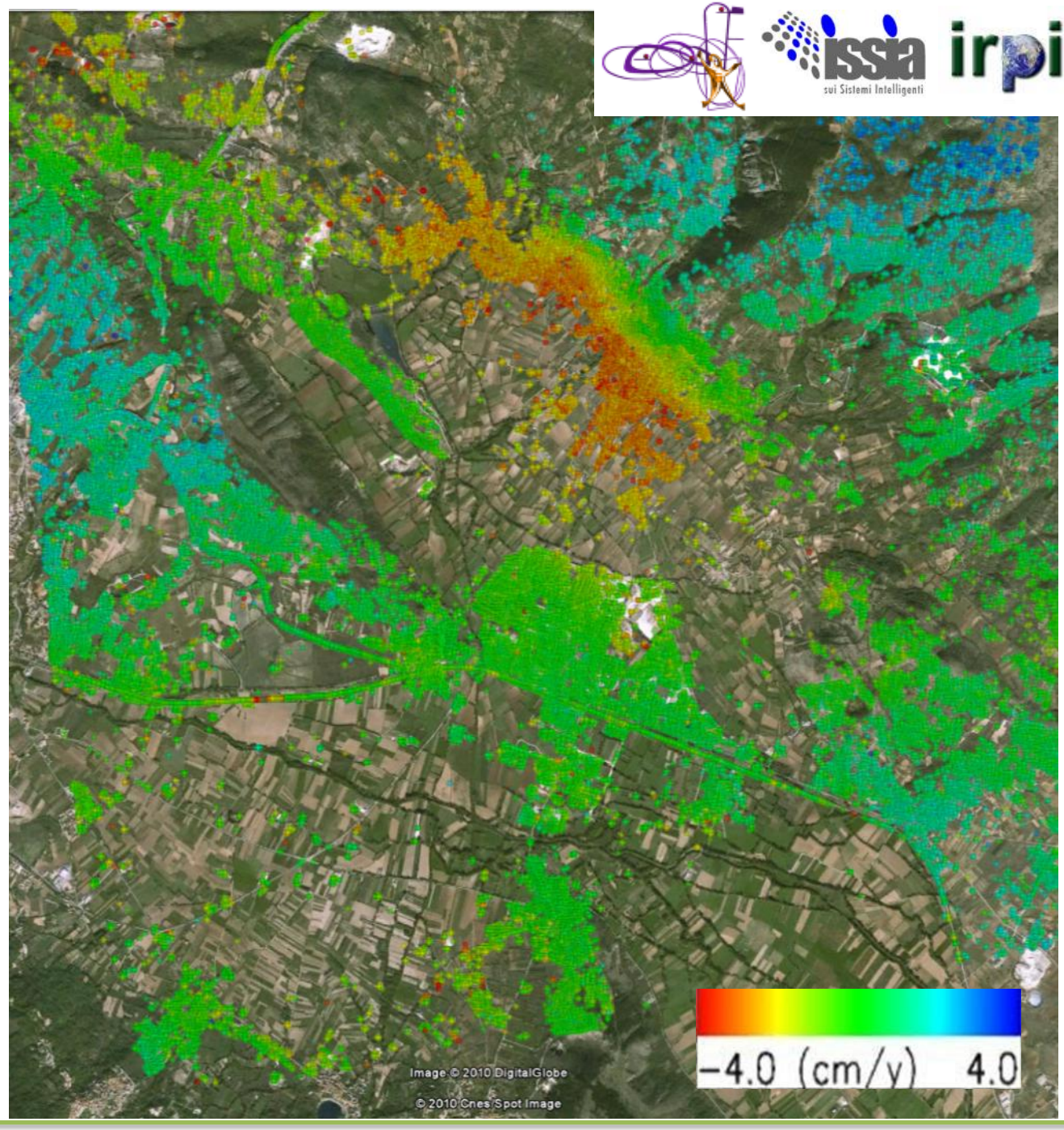
Goal: prototype landslide warning service development , based on the use of periodic earth observation data integrated with other in situ geotechnical data

FIFTH FRAMEWORK PROGRAMME

PSI monitoring examples

Sensor:
COSMO/SkyMed
Dataset: Apr-Oct'09

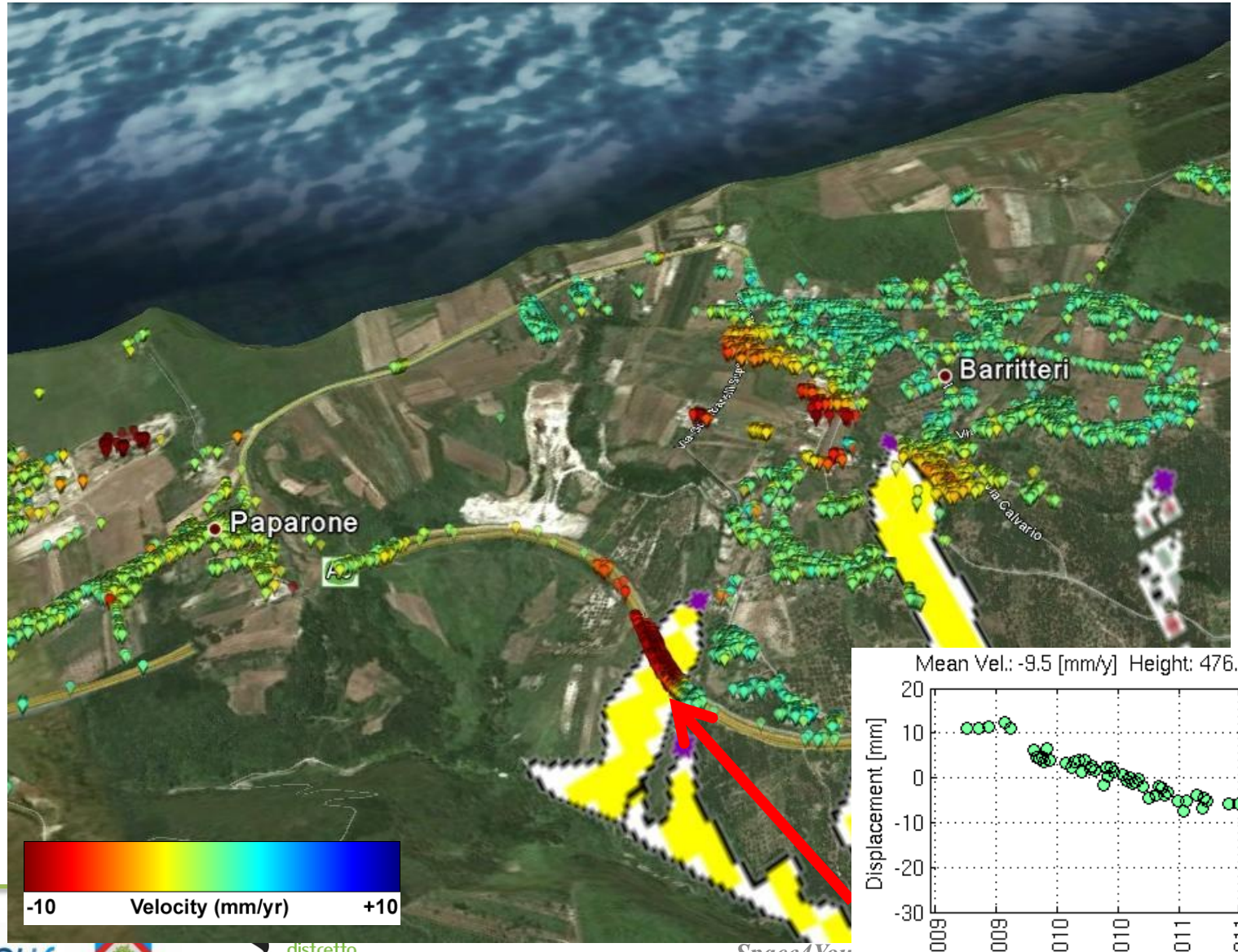
Test Site: Paganica (AQ)
Post-seismic Analysis



PSI monitoring examples

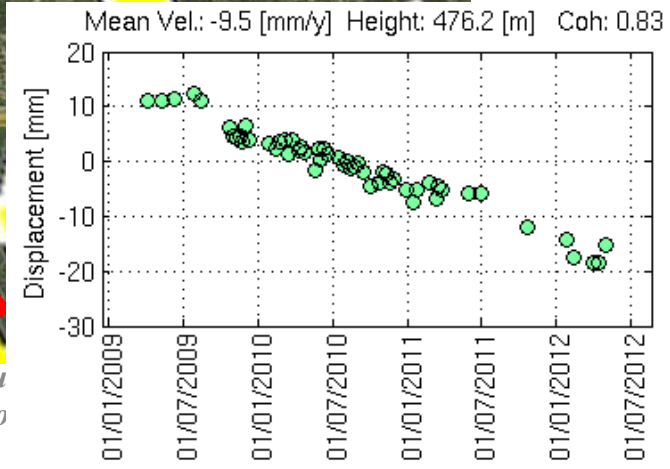
Sensor: COSMO/SkyMed - Dataset: Jan'09-Jul'12

Test Site: Highway A3 Napoli-Reggio Calabria



Type of movement — **IFFI**

- Rockfall/topple
- Rotational/translational slide
- Lateral spread
- Slow earth flow
- Rapid debris flow
- Sinkhole
- Complex landslide
- Unclassified
- Deep-seated gravitational slope deformation
- Area affected by rockfalls/topples
- Area affected by sinkholes
- Area affected by shallow lanslides

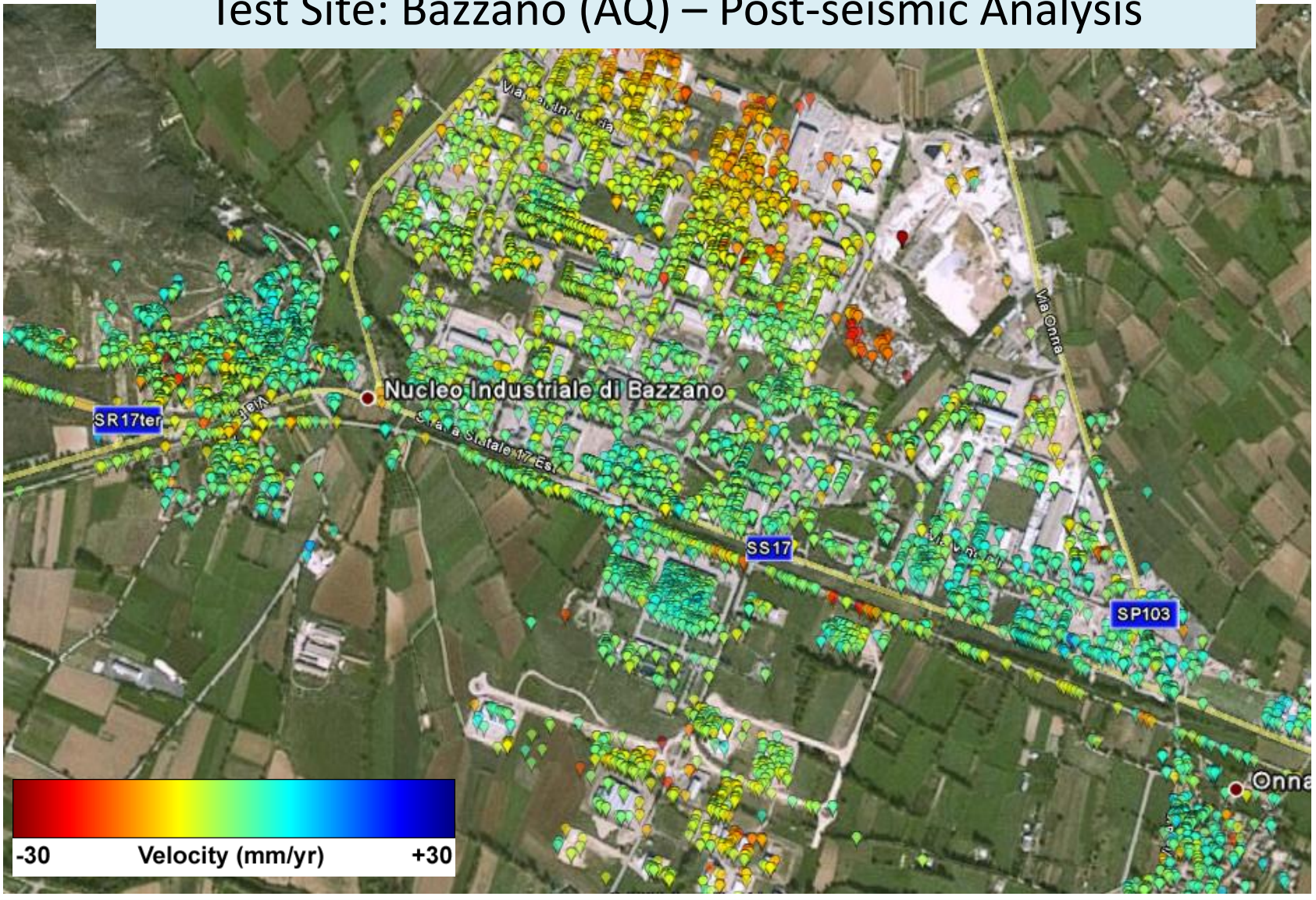


Space4You
Bari, Ho

PSI monitoring examples

Sensor: COSMO/SkyMed - Dataset: Apr-Oct'09

Test Site: Bazzano (AQ) – Post-seismic Analysis



PSI monitoring examples

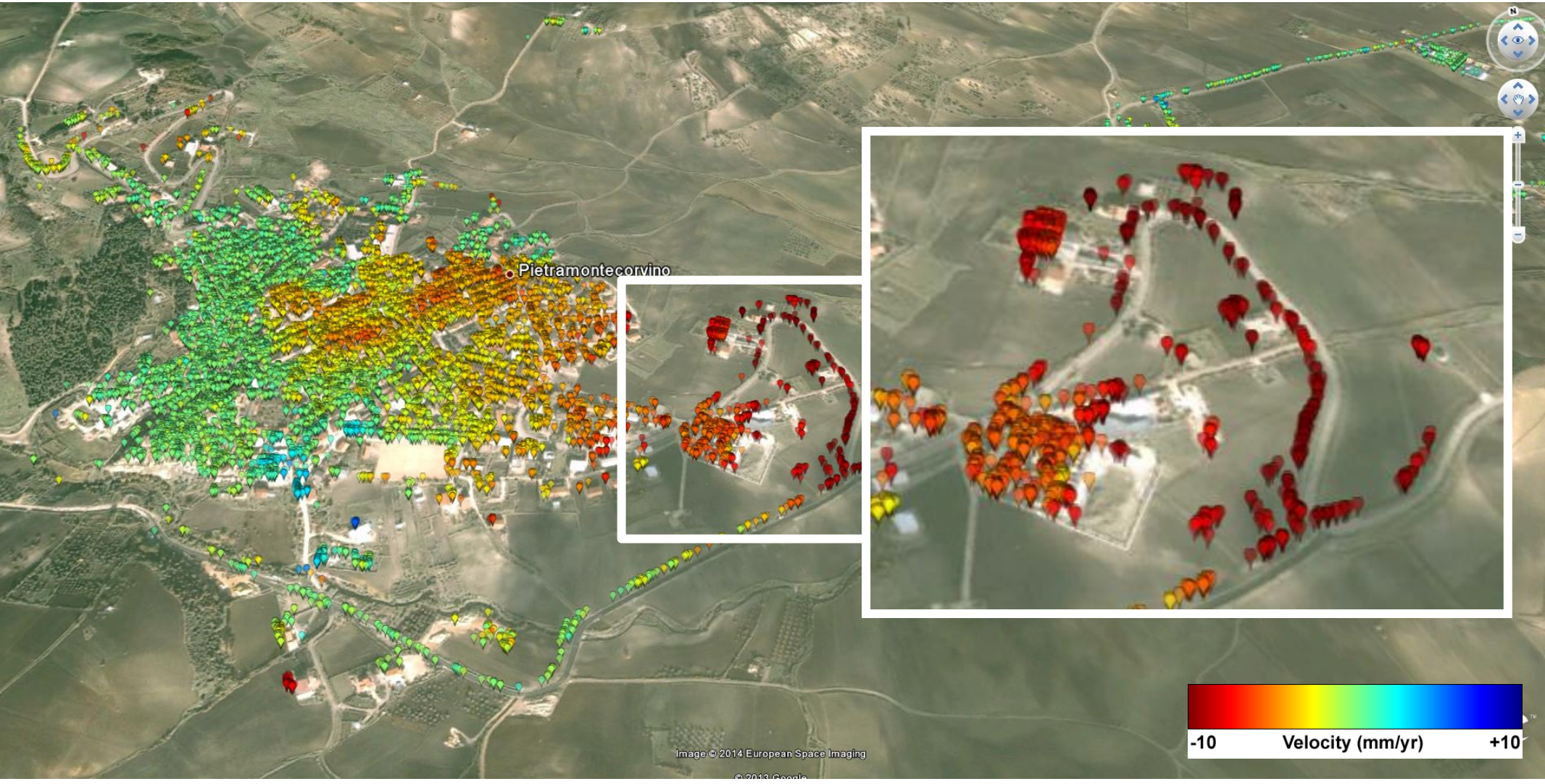
Sensor: COSMO/SkyMed - Dataset: Apr-Oct'09

Test Site: L'Aquila – Post-seismic Analysis

PSI monitoring examples

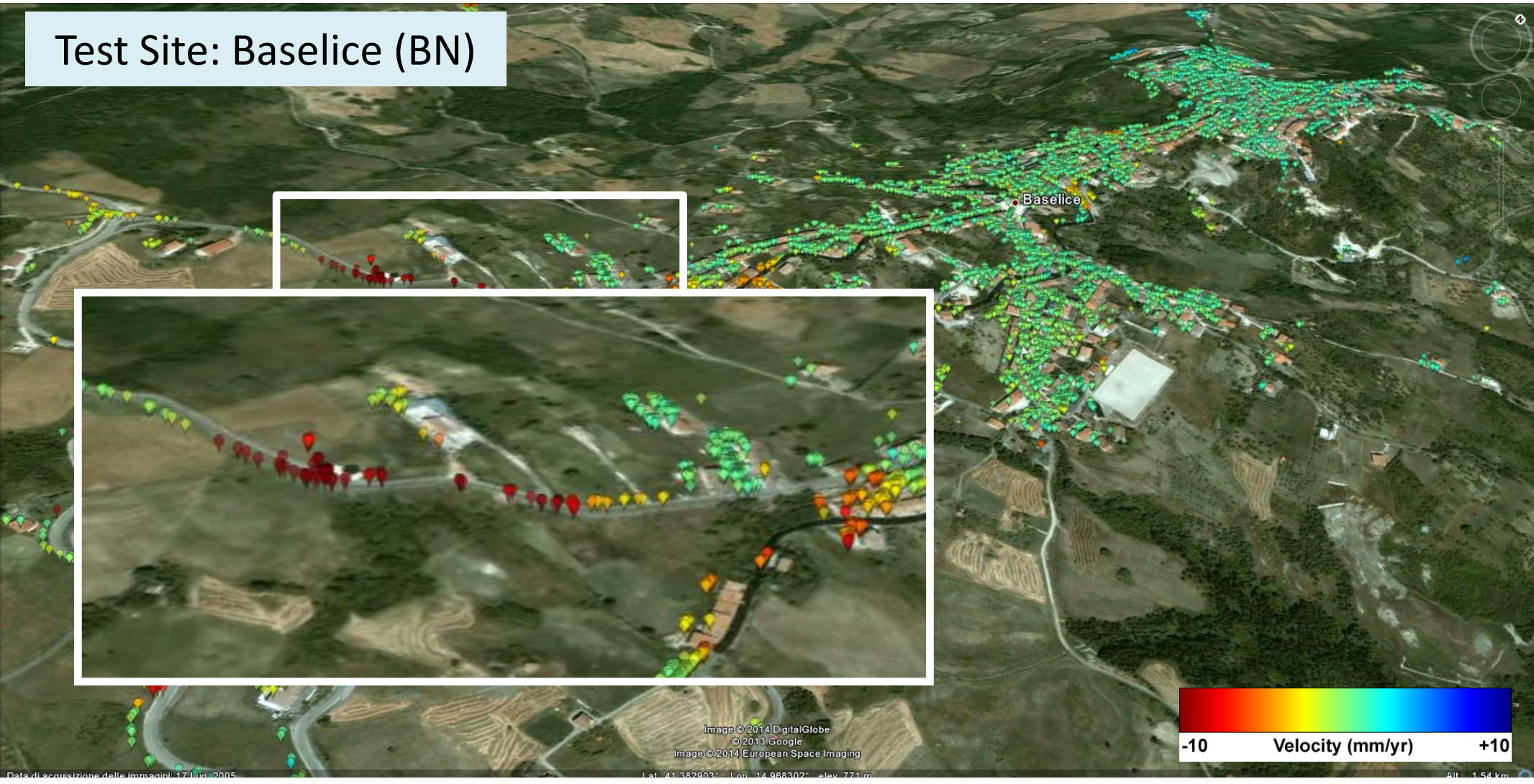
Sensor: TerraSAR-X - Dataset: Jan'10-Mar'11

Test Site: Pietramontecorvino (FG) – Daunia, Italy



PSI monitoring examples

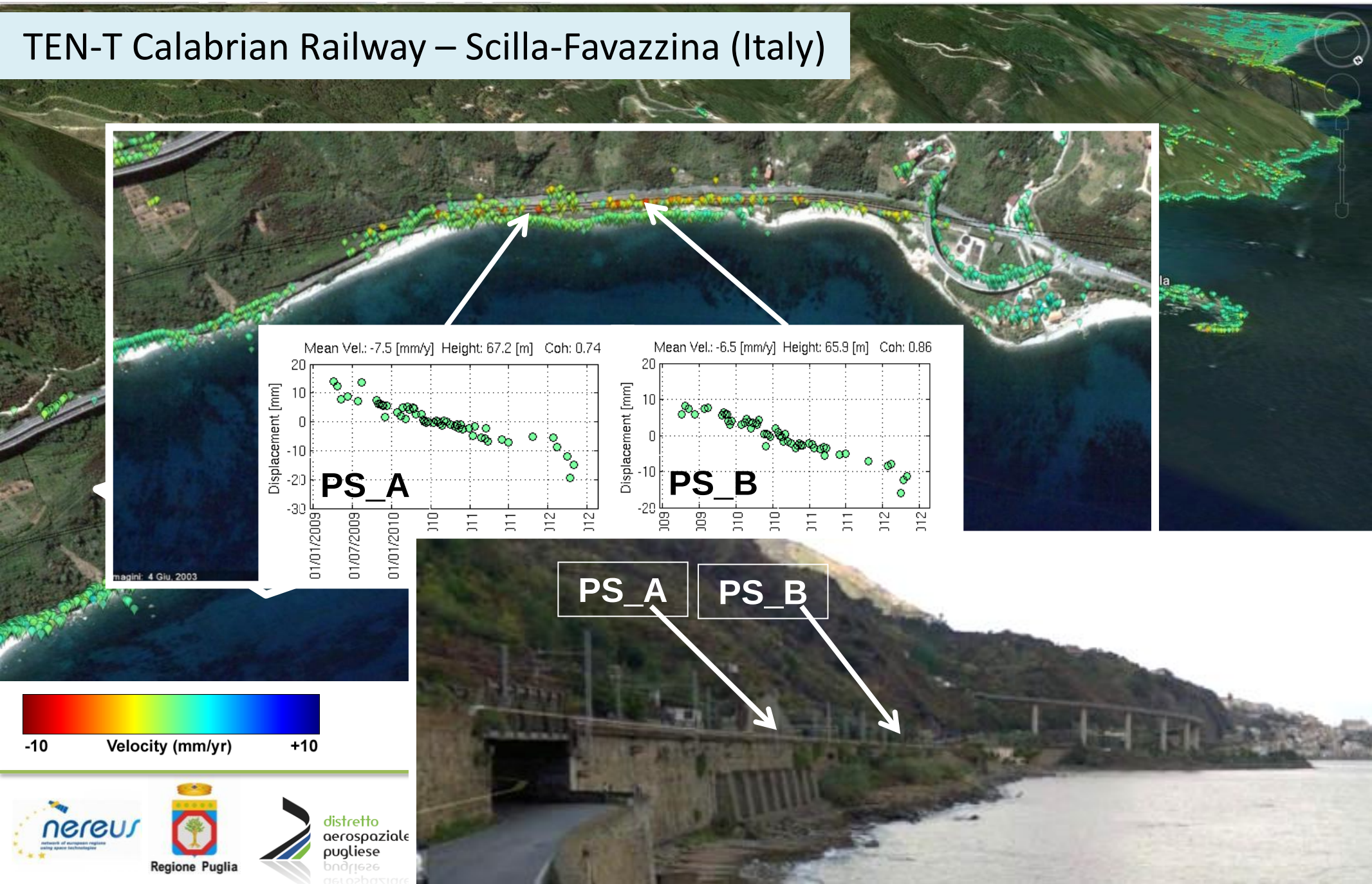
Sensor: TerraSAR-X - Dataset: Jan'10-Mar'11



PSI monitoring examples

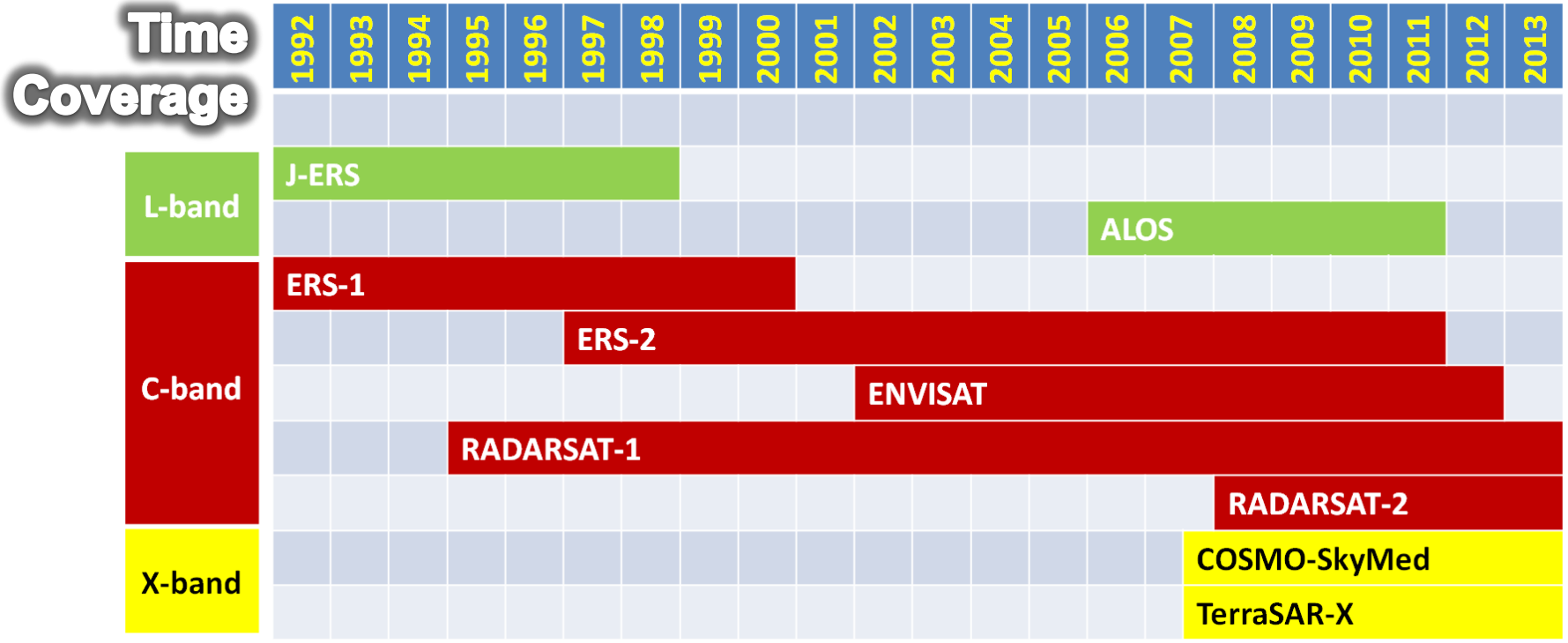
Sensor: COSMO/SkyMed - Dataset: Jan'09-Jul'12

TEN-T Calabrian Railway – Scilla-Favazzina (Italy)



Environmental Monitoring

Satellite Synthetic Aperture Radar Missions

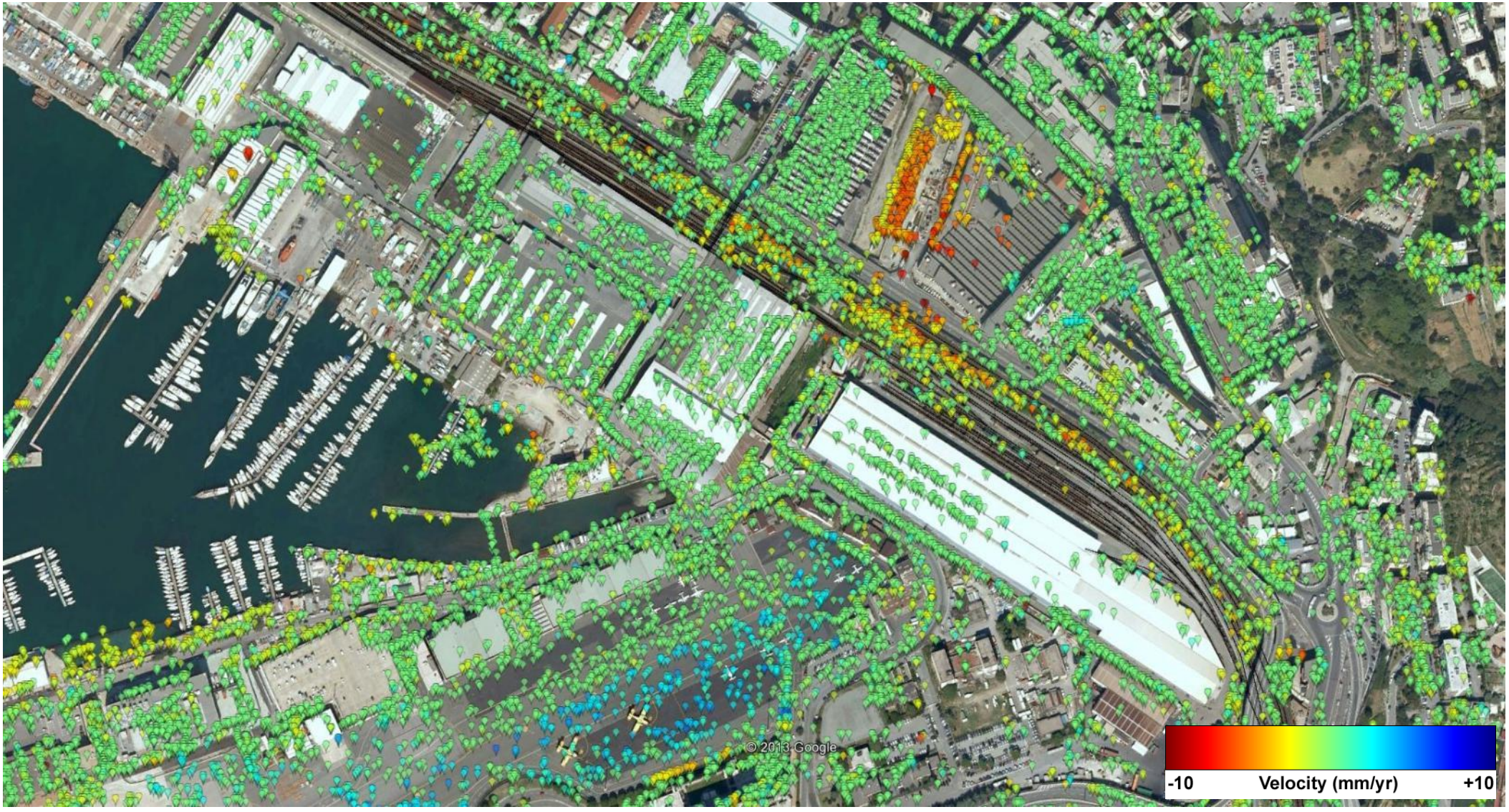


- ✓ Historical Analysis (exploitation of existing SAR datasets)
- ✓ Monitoring (tasking of operational satellites for new acquisitions over the AOI)

PSI monitoring examples

Test Site: Genoa
Sestri P. Rail Station

Sensor: COSMO/SkyMed - Dataset: Feb'11-Nov'13

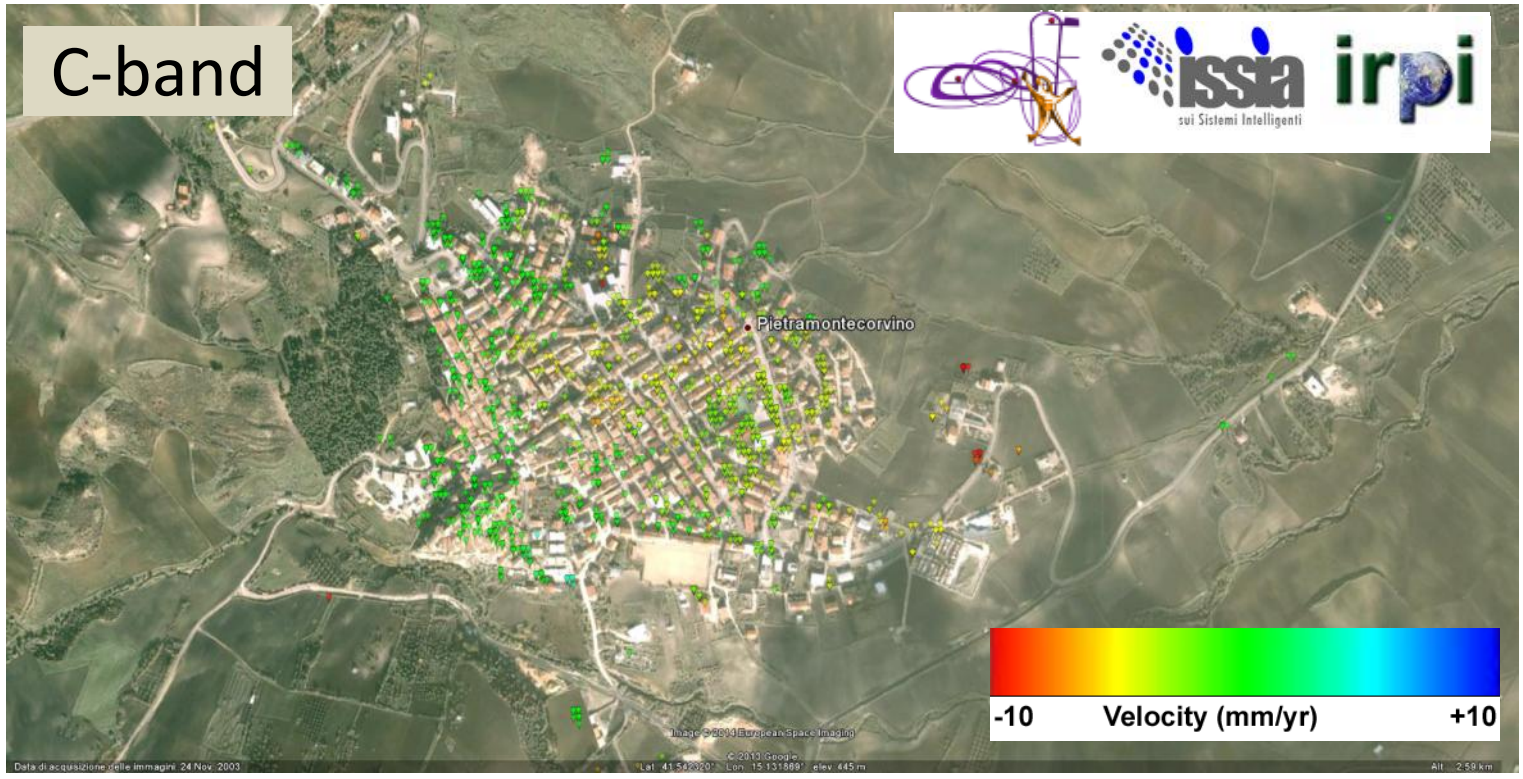


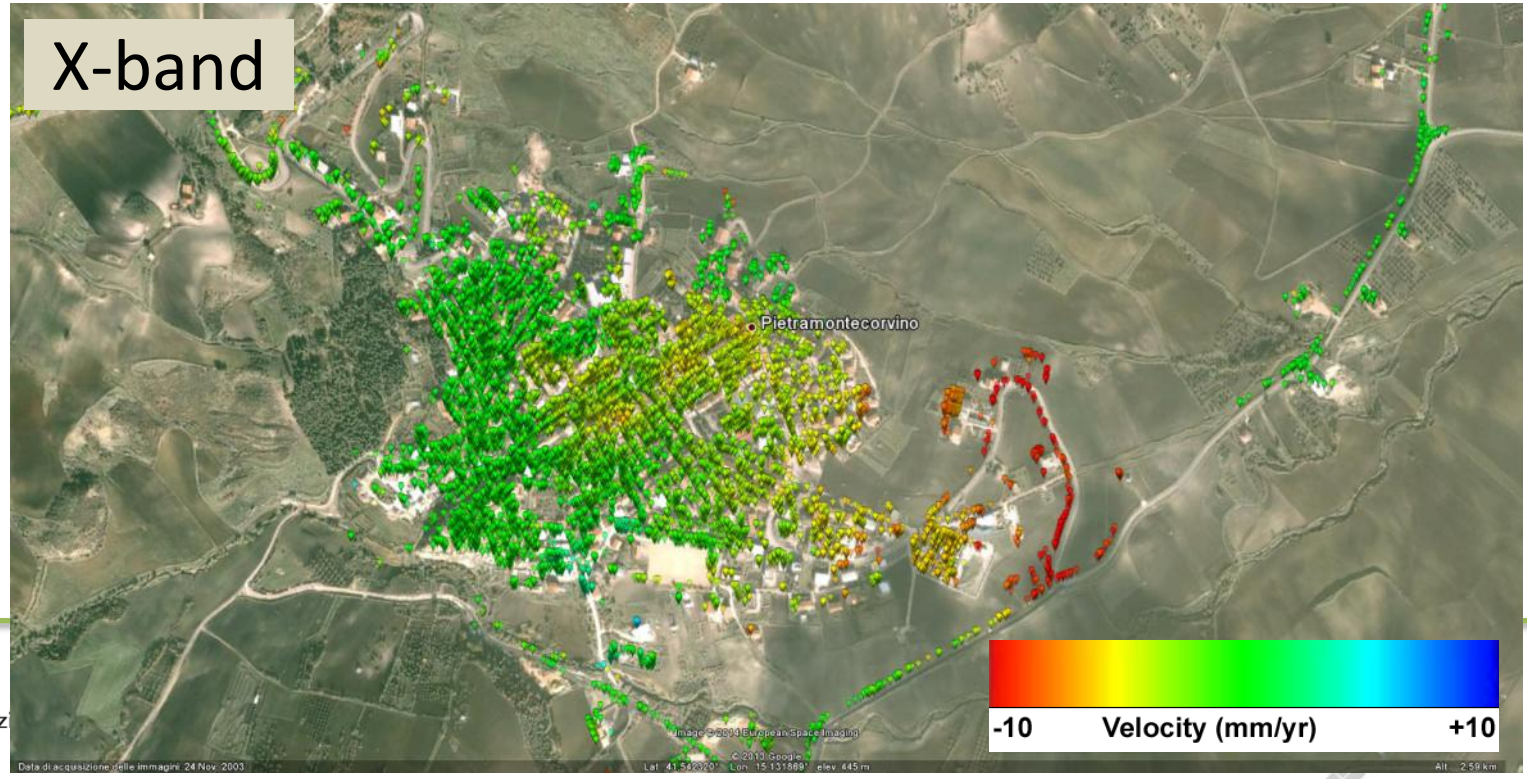
C- vs X-band PSI maps

Test Site: Daunia
Pietramontecorvino

C-band dataset
Sensor: ENVISAT
Oct'02-Jan'10

X-band dataset
Sensor: TerraSAR-X
Jan'10-Mar'11



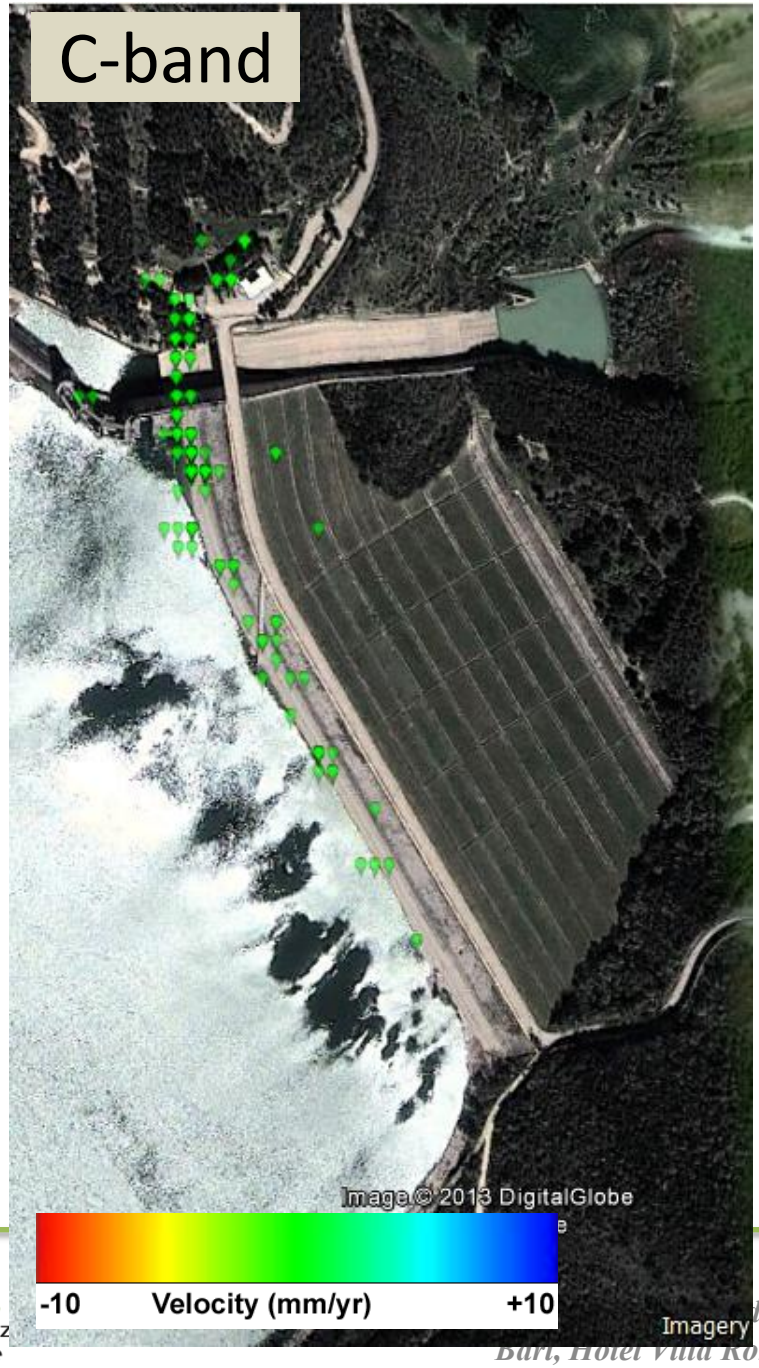


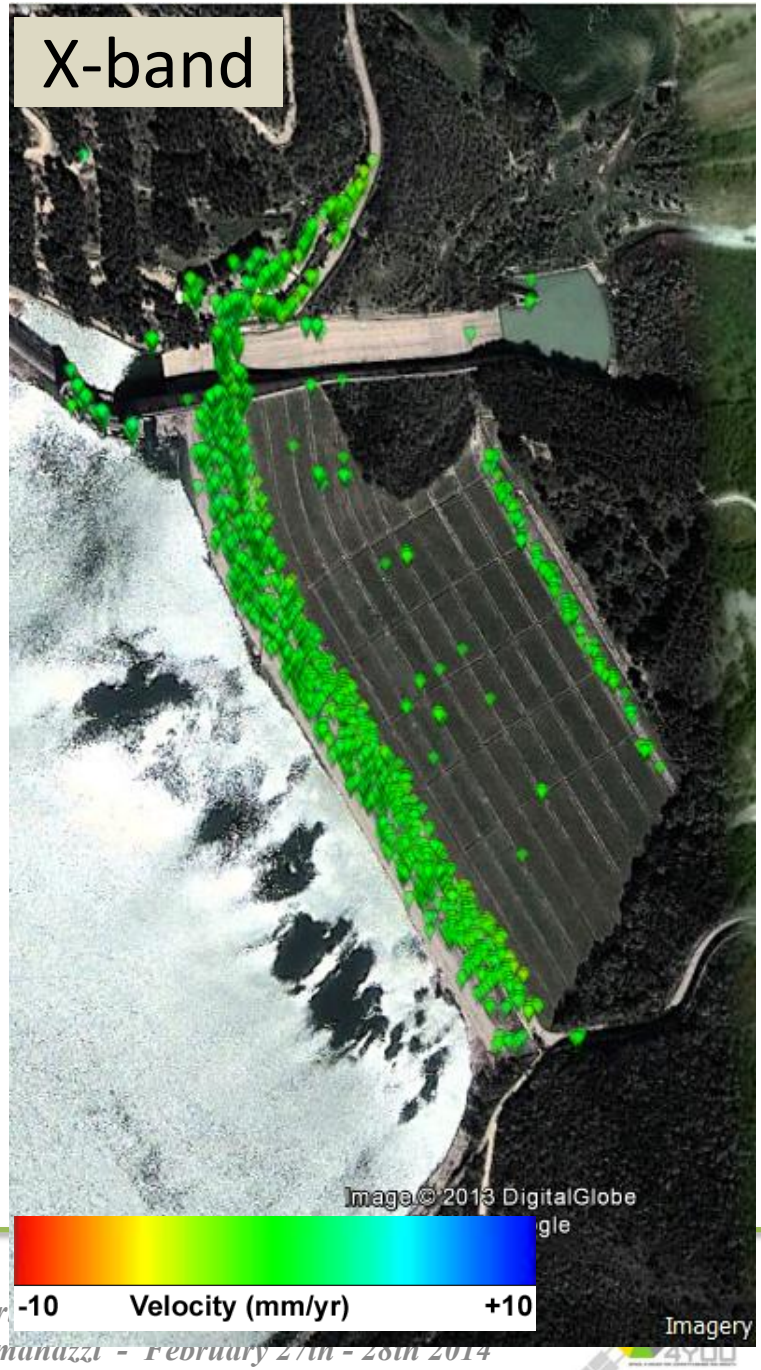
C-band vs X-band PSI maps

Test Site: Dam Occhito, Daunia

C-band dataset
Sensor: ENVISAT
Oct'02-Jan'10

X-band dataset
Sensor: TerraSAR-X
Jan'10-Mar'11



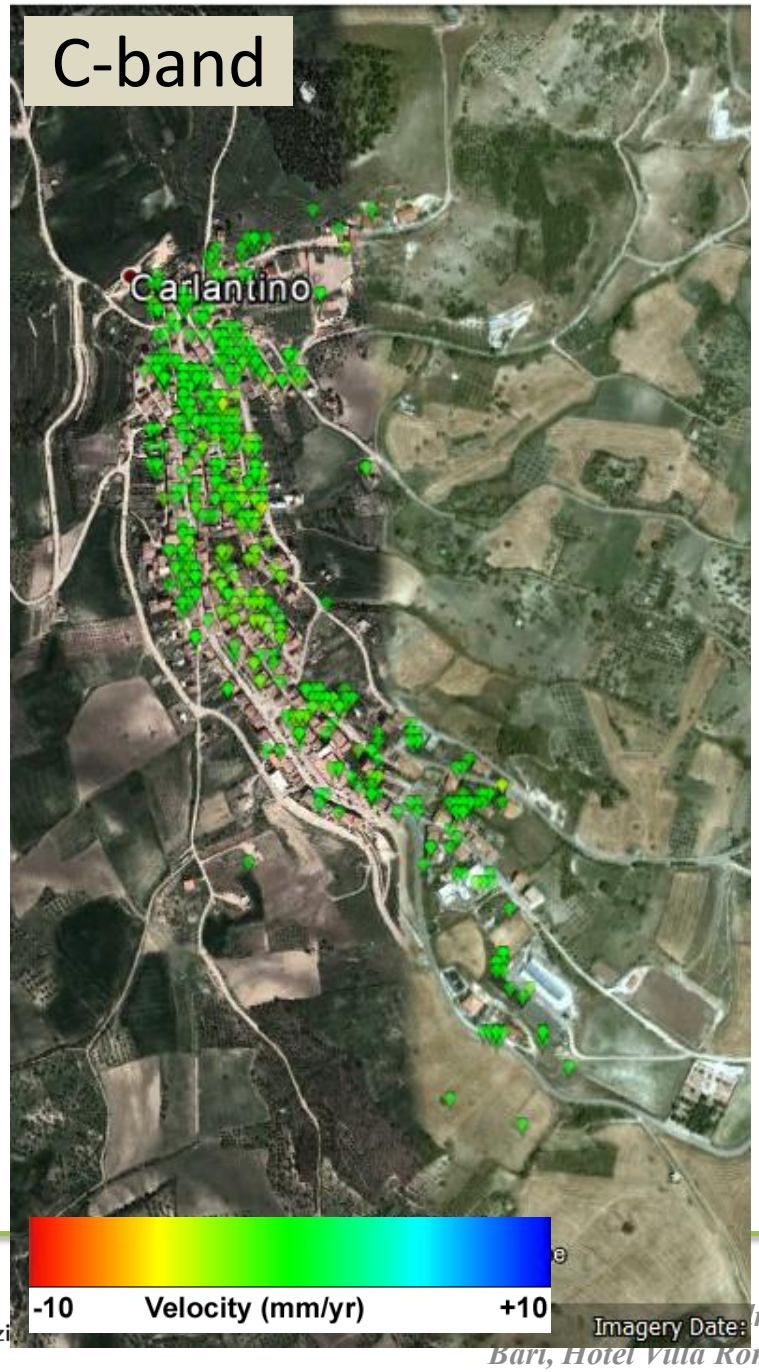


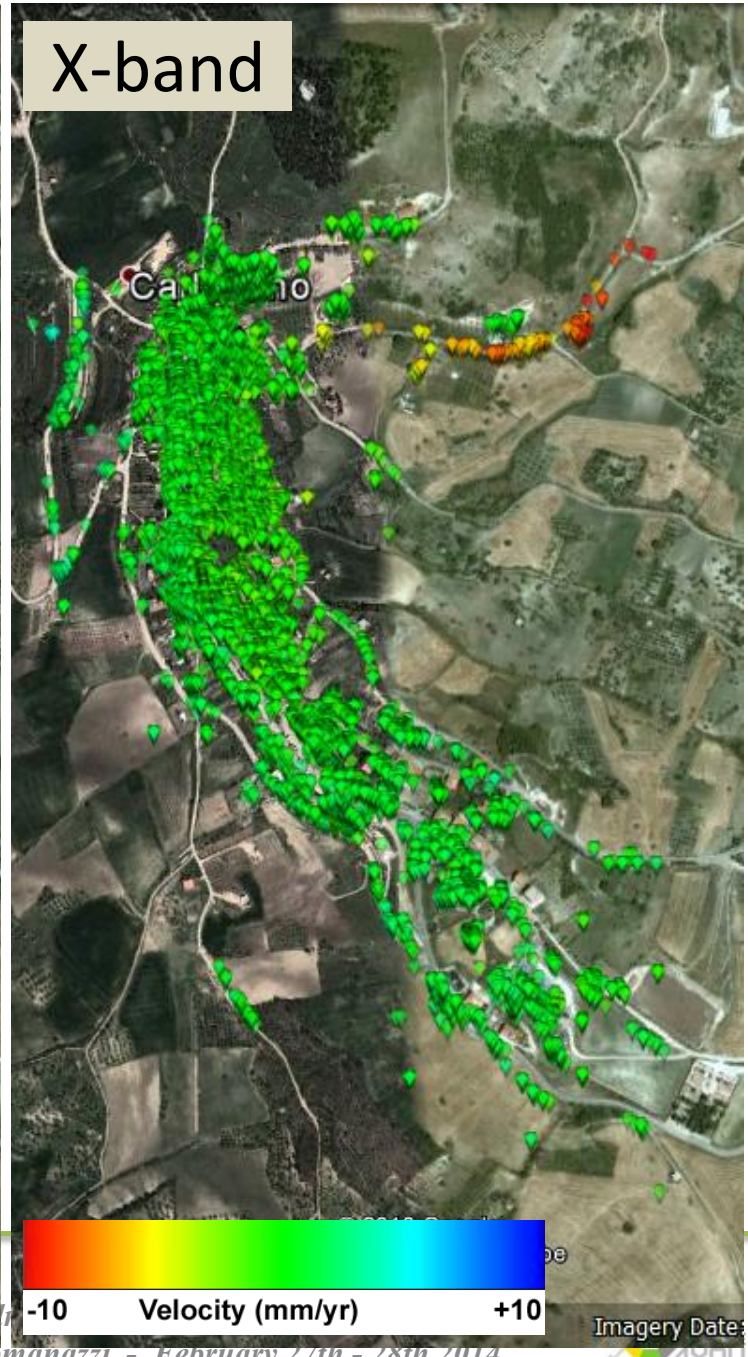
C-band vs X-band PSI maps

Test Site
Carlantino, Daunia

C-band dataset
Sensor: ENVISAT
Oct'02-Jan'10

X-band dataset
Sensor: TerraSAR-X
Jan'10-Mar'11





Research Projects

GeoHazards/Infrastructure Monitoring Through EO technologies

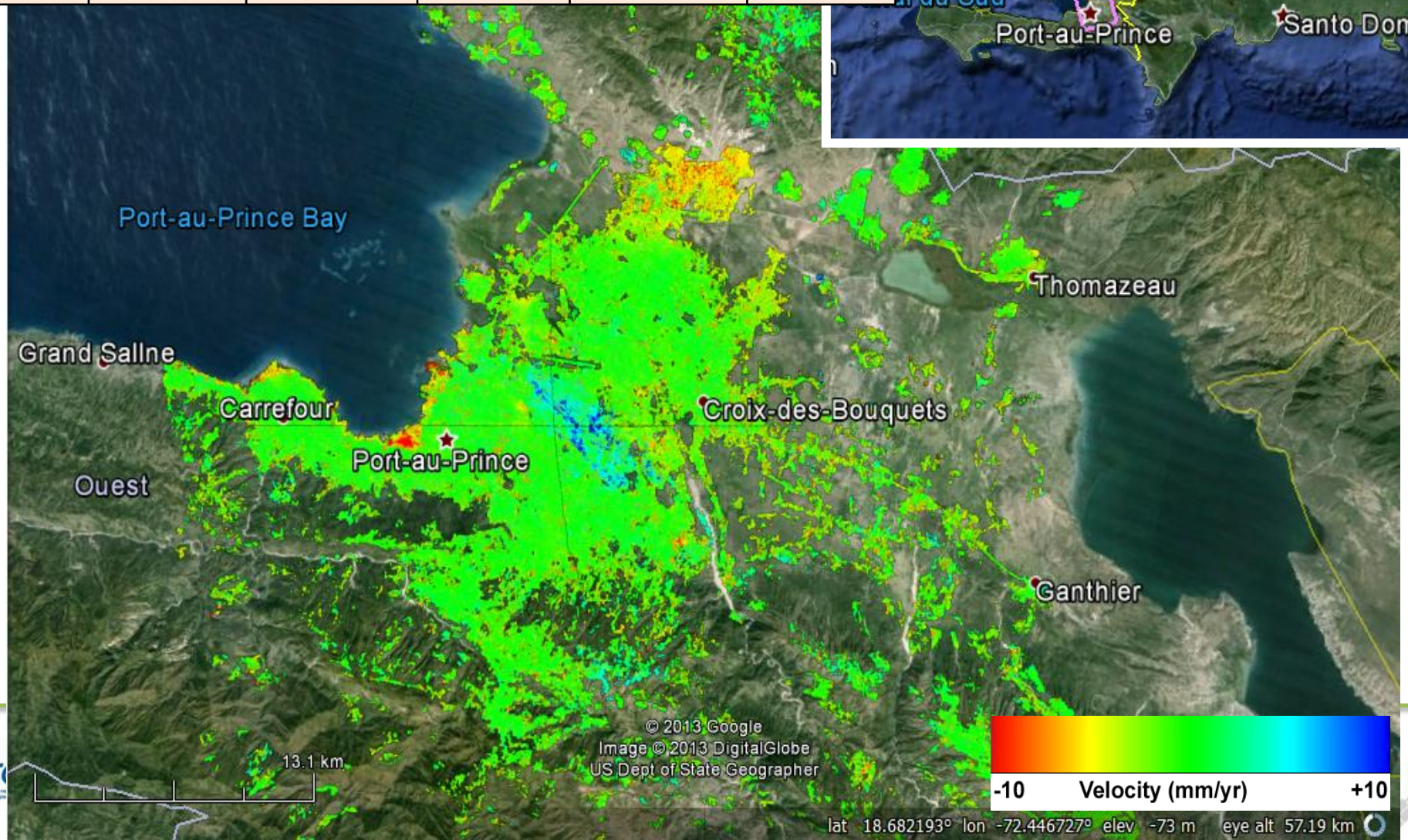
Project Name	Acronym (IT/EN)	Funding Institution	Prime
MORFEO	*Monitoraggio del Rischio da Frana con tecnologie EO*	Progetto Pilota ASI	CGS Carlo Gavazzi Space SpA
	Landslide Monitoring and Risk Assessment through EO data		
FranePuglia	*FranePuglia*	Regione Puglia PO FESR 2007-2013	GAP – Geophysical Applications Processing SrL
	ApulianLandslides		
ADF	*Archiviazione e Fusione di Dati EO*	ASI II Bando PMI	Planetek Italia SrL
	Archiving Data Fusion		
CAR-SLIDE	*Sistema di monitoraggio e mappatura di eventi franosi*	MIUR PON R&C 2007-2013	TecnoGamma SpA
	Landslide Monitoring and Mapping System		

PSI monitoring examples

Sensor: COSMO/SkyMed

Test Site: Haiti

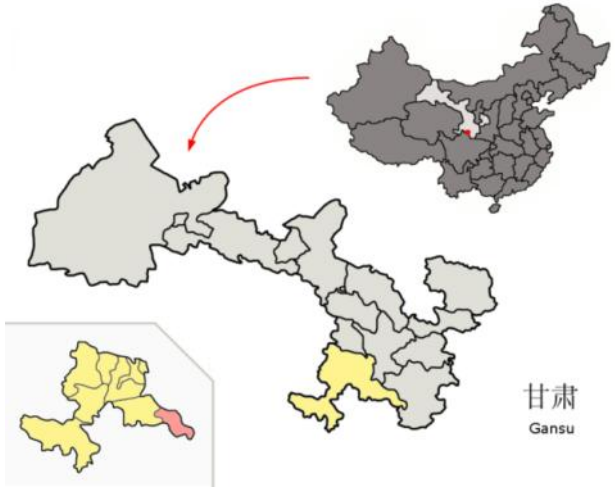
Year 2011		Year 2012		Year 2013	
(23 images)		(42 images)		(38 images)	
2011 I Semester	2011 II Semester	2012 I Semester	2012 II Semester	2013 I Semester	2013 II Semester
(1 image)	(22 images)	(22 images)	(20 images)	(29 images)	(9 images)

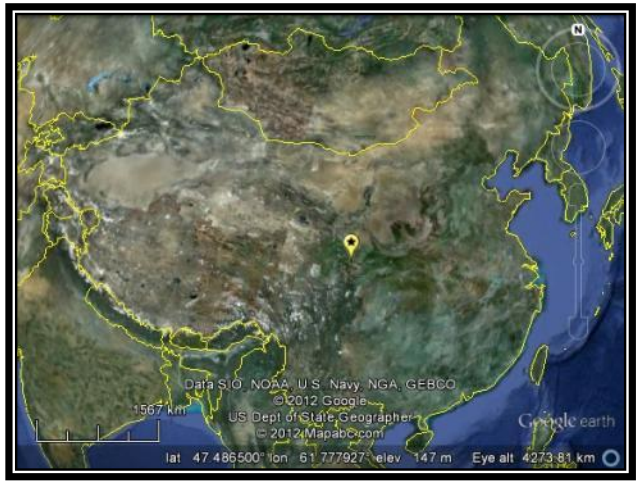


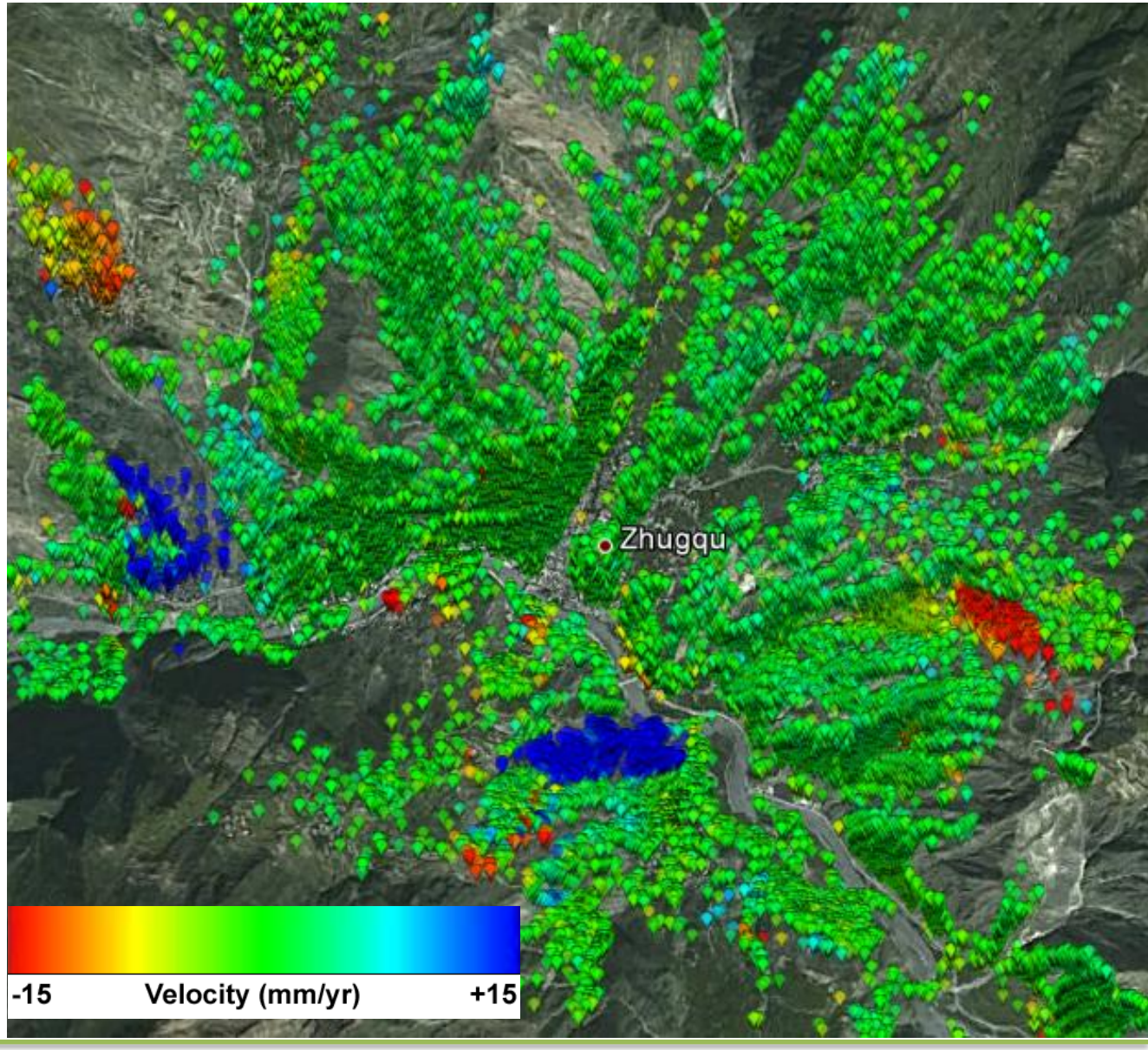
PSI monitoring examples

Sensor: COSMO/SkyMed – Dataset: Nov'10-Feb'12

Test Site:
Zhouqu, Gansu, China







Future perspectives

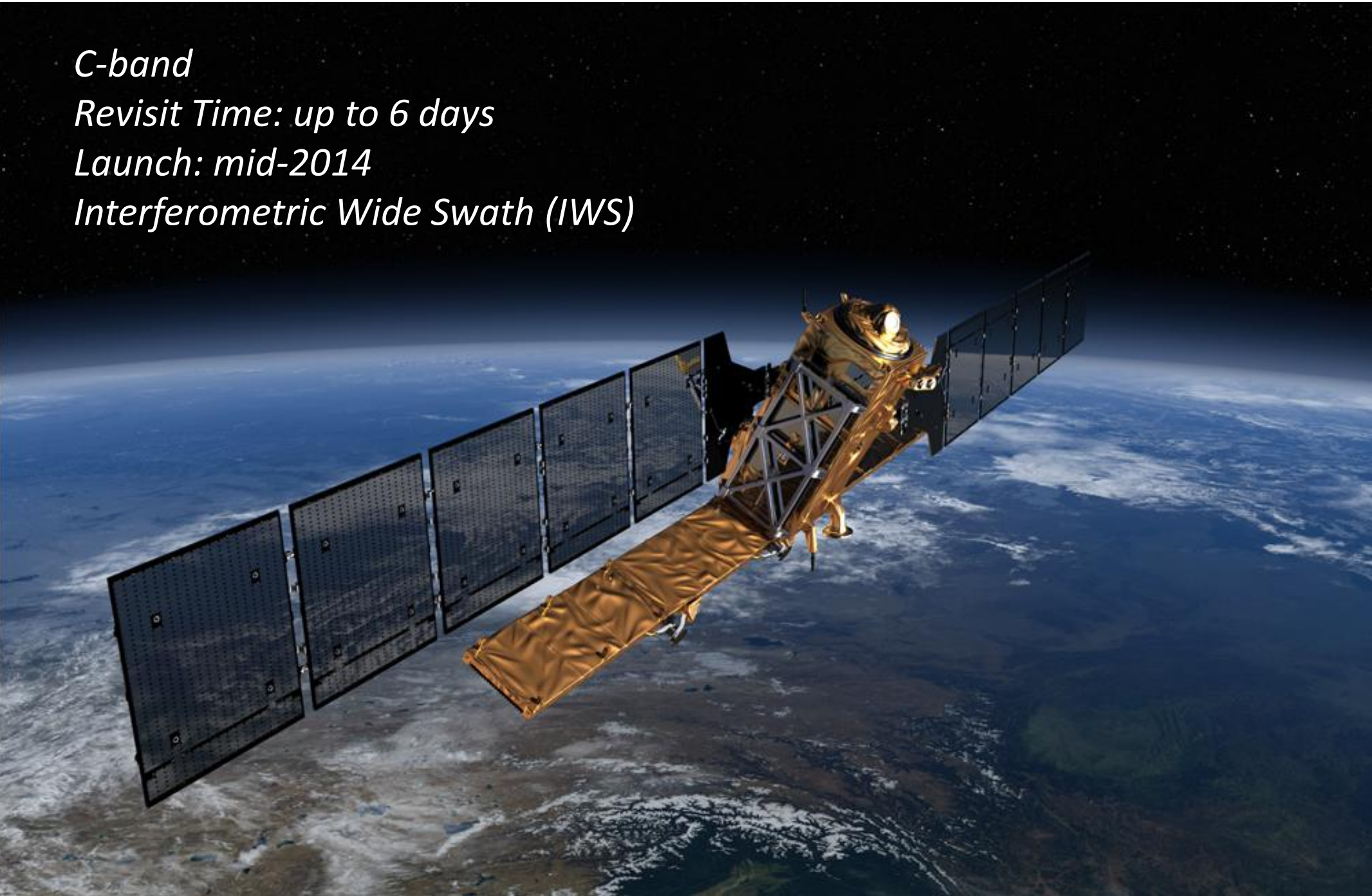
Sentinel-1

C-band

Revisit Time: up to 6 days

Launch: mid-2014

Interferometric Wide Swath (IWS)



Info and Contacts

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